

## RF Exposure Report

**Report No.:** SABFBE-WTW-P21031123

**FCC ID:** I88DX4510-B0

**Test Model:** DX4510-B0

**Received Date:** Mar. 23, 2021

**Test Date:** May 11, 2021

**Issued Date:** Apr. 15, 2022

**Applicant:** Zyxel Communications Corporation

**Address:** No.2 Industry East RD. IX, Hsinchu Science Park, Hsinchu 30075, Taiwan

**Issued By:** Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch  
Hsin Chu Laboratory

**Lab Address:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**FCC Registration /  
Designation Number:** 723255 / TW2022



This report is for your exclusive use. Any copying or replication of this report to or for any other person or entity, or use of our name or trademark, is permitted only with our prior written permission. This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted. Our report includes all of the tests requested by you and the results thereof based upon the information that you provided to us. You have 60 days from date of issuance of this report to notify us of any material error or omission caused by our negligence, provided, however, that such notice shall be in writing and shall specifically address the issue you wish to raise. A failure to raise such issue within the prescribed time shall constitute your unqualified acceptance of the completeness of this report, the tests conducted and the correctness of the report contents. Unless specific mention, the uncertainty of measurement has been explicitly taken into account to declare the compliance or non-compliance to the specification.

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### Release Control Record

| Issue No.            | Description       | Date Issued   |
|----------------------|-------------------|---------------|
| SABFBE-WTW-P21031123 | Original release. | Apr. 15, 2022 |

## 1 Certificate of Conformity

**Product:** AX6000 WiFi6 VDSL2 Bonding Gateway

**Brand:** ZYXEL

**Test Model:** DX4510-B0

**Sample Status:** Engineering sample

**Applicant:** Zyxel Communications Corporation

**Test Date:** May 11, 2021

**Standards:** FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

**Prepared by :** Vivian Huang , **Date:** Apr. 15, 2022  
Vivian Huang / Specialist

**Approved by :** [Signature] , **Date:** Apr. 15, 2022  
May Chen / Manager

## 2 RF Exposure

### 2.1 Limits for Maximum Permissible Exposure (MPE)

| Frequency Range (MHz)                                 | Electric Field Strength (V/m) | Magnetic Field Strength (A/m) | Power Density (mW/cm <sup>2</sup> ) | Average Time (minutes) |
|-------------------------------------------------------|-------------------------------|-------------------------------|-------------------------------------|------------------------|
| Limits For General Population / Uncontrolled Exposure |                               |                               |                                     |                        |
| 0.3-1.34                                              | 614                           | 1.63                          | (100)*                              | 30                     |
| 1.34-30                                               | 824/f                         | 2.19/f                        | (180/f <sup>2</sup> )*              | 30                     |
| 30-300                                                | 27.5                          | 0.073                         | 0.2                                 | 30                     |
| 300-1500                                              | ...                           | ...                           | f/1500                              | 30                     |
| 1500-100,000                                          | ...                           | ...                           | 1.0                                 | 30                     |

f = Frequency in MHz ; \*Plane-wave equivalent power density

### 2.2 MPE Calculation Formula

$$P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$$

where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$R$  = distance between observation point and center of the radiator in cm

### 2.3 Classification

The antenna of this product, under normal use condition, is at least 22 cm away from the body of the user. So, this device is classified as **Mobile Device**.

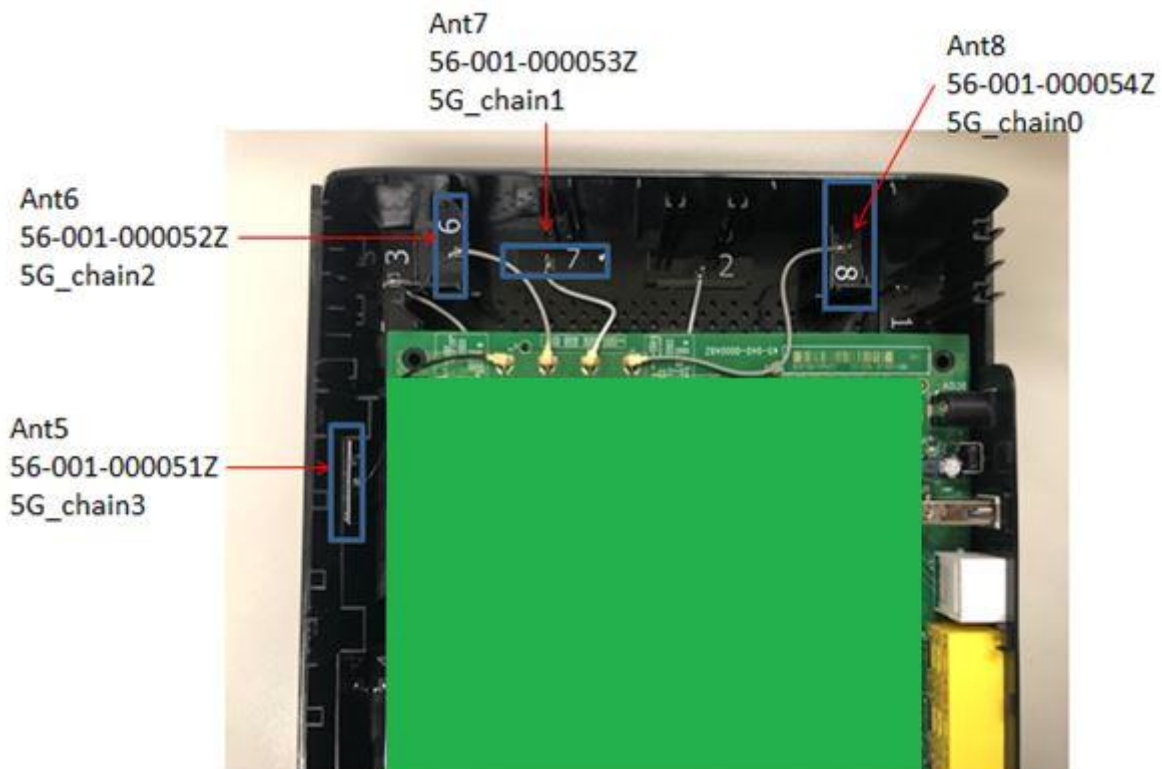
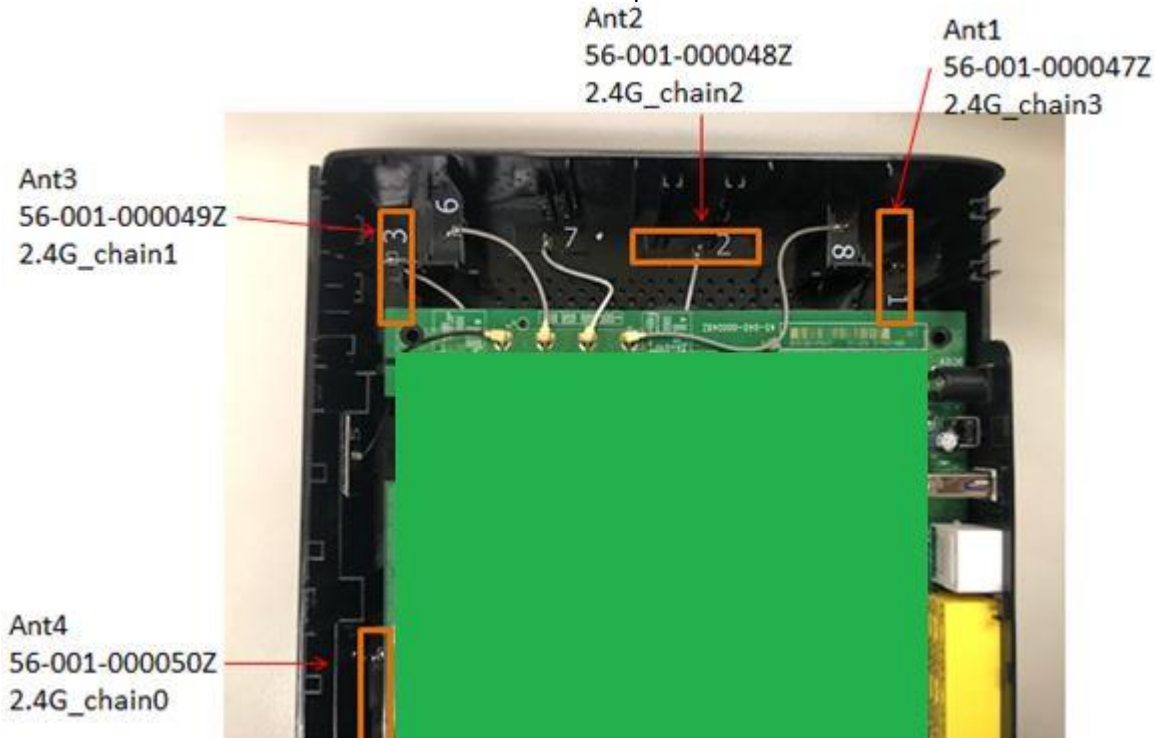
## 2.4 Antenna Gain

| Antenna No. | RF Chain No. | Brand | Model          | Antenna Net Gain (dBi) | Frequency Range (GHz) | Antenna Type | Connector Type | Cable Length (mm) |
|-------------|--------------|-------|----------------|------------------------|-----------------------|--------------|----------------|-------------------|
| 1           | 2.4G_Chain 3 | WHAYU | 56-001-000047Z | 2.7                    | 2.4~2.4835            | Dipole       | i-pex(MHF)     | 313               |
| 2           | 2.4G_Chain 2 | WHAYU | 56-001-000048Z | 2.31                   | 2.4~2.4835            | Dipole       | i-pex(MHF)     | 258               |
| 3           | 2.4G_Chain 1 | WHAYU | 56-001-000049Z | 2.57                   | 2.4~2.4835            | Dipole       | i-pex(MHF)     | 263               |
| 4           | 2.4G_Chain 0 | WHAYU | 56-001-000050Z | 2.53                   | 2.4~2.4835            | Dipole       | i-pex(MHF)     | 145               |
| 5           | 5G_Chain 3   | WHAYU | 56-001-000051Z | 2.6                    | 5.15~5.25             | Dipole       | i-pex(MHF)     | 59                |
|             |              |       |                | 2.92                   | 5.25~5.35             |              |                |                   |
|             |              |       |                | 3.31                   | 5.47~5.725            |              |                |                   |
|             |              |       |                | 3.16                   | 5.725~5.85            |              |                |                   |
| 6           | 5G_Chain 2   | WHAYU | 56-001-000052Z | 2.99                   | 5.15~5.25             | Dipole       | i-pex(MHF)     | 40                |
|             |              |       |                | 3.22                   | 5.25~5.35             |              |                |                   |
|             |              |       |                | 3.13                   | 5.47~5.725            |              |                |                   |
|             |              |       |                | 2.18                   | 5.725~5.85            |              |                |                   |
| 7           | 5G_Chain 1   | WHAYU | 56-001-000053Z | 3.48                   | 5.15~5.25             | Dipole       | i-pex(MHF)     | 45                |
|             |              |       |                | 3.09                   | 5.25~5.35             |              |                |                   |
|             |              |       |                | 3.79                   | 5.47~5.725            |              |                |                   |
|             |              |       |                | 2.46                   | 5.725~5.85            |              |                |                   |
| 8           | 5G_Chain 0   | WHAYU | 56-001-000054Z | 0.63                   | 5.15~5.25             | Dipole       | i-pex(MHF)     | 80                |
|             |              |       |                | 2.62                   | 5.25~5.35             |              |                |                   |
|             |              |       |                | 2.61                   | 5.47~5.725            |              |                |                   |
|             |              |       |                | 3.73                   | 5.725~5.85            |              |                |                   |

### Note:

1. Antenna Gain refer to "P21031123 Multi-Antenna Systems Directional Gain measurement" files.
2. Maximum Correlated Directional Gain following KDB662911 D03 MIMO Antenna Gain Measurement.

\* Antenna port location



Note: The above Antenna information is declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications, the laboratory shall not be held responsible.

## 2.5 Calculation Result

### CDD Mode

| Operation Mode | Evaluation Frequency (MHz) | Max. Average Power (mW) | Maximum Antenna Gain (dBi) | Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Pass/Fail |
|----------------|----------------------------|-------------------------|----------------------------|---------------|-------------------------------------|-----------------------------|-----------|
| WLAN 2.4GHz    | 2412~2462                  | 992.518                 | 2.7                        | 22            | 0.30387                             | 1                           | Pass      |
| WLAN U-NII-1   | 5180~5250                  | 978.408                 | 3.48                       | 22            | 0.35848                             | 1                           | Pass      |
| WLAN U-NII-2A  | 5250~5320                  | 247.677                 | 3.22                       | 22            | 0.08547                             | 1                           | Pass      |
| WLAN U-NII-2C  | 5500~5720                  | 247.904                 | 3.79                       | 22            | 0.09755                             | 1                           | Pass      |
| WLAN U-NII-3   | 5745~5825                  | 989.441                 | 3.73                       | 22            | 0.384                               | 1                           | Pass      |

### Beamforming Mode

| Operation Mode | Evaluation Frequency (MHz) | Max. Average Power (mW) | Directional Antenna Gain (dBi) | Distance (cm) | Power Density (mW/cm <sup>2</sup> ) | Limit (mW/cm <sup>2</sup> ) | Pass/Fail |
|----------------|----------------------------|-------------------------|--------------------------------|---------------|-------------------------------------|-----------------------------|-----------|
| WLAN 2.4GHz    | 2412~2462                  | 974.469                 | 3.34                           | 22            | 0.34571                             | 1                           | Pass      |
| WLAN U-NII-1   | 5180~5250                  | 978.408                 | 4.98                           | 22            | 0.50637                             | 1                           | Pass      |
| WLAN U-NII-2A  | 5250~5320                  | 247.677                 | 4.28                           | 22            | 0.1091                              | 1                           | Pass      |
| WLAN U-NII-2C  | 5500~5720                  | 247.904                 | 3.07                           | 22            | 0.08265                             | 1                           | Pass      |
| WLAN U-NII-3   | 5745~5825                  | 989.441                 | 3.18                           | 22            | 0.33833                             | 1                           | Pass      |

Note:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: The directional gain = 3.34dBi  
5GHz (U-NII-1): The directional gain = 4.98dBi  
5GHz (U-NII-2A): The directional gain = 4.28dBi  
5GHz (U-NII-2C): The directional gain = 3.07dBi  
5GHz (U-NII-3): The directional gain = 3.18dBi

**Conclusion:**

The formula of calculated the MPE is:

$$\text{CPD1} / \text{LPD1} + \text{CPD2} / \text{LPD2} + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

**CDD Mode**

$$\text{WLAN 2.4GHz} + \text{WLAN 5GHz} = 0.30387 / 1 + 0.384 / 1 = 0.68787$$

**Beamforming Mode**

$$\text{WLAN 2.4GHz} + \text{WLAN 5GHz} = 0.34571 / 1 + 0.50637 / 1 = 0.85208$$

Therefore the maximum calculations of above situations are less than the “1” limit.

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